Flame Retardant Alternatives

Tribromoneopentyl Alcohol

Hazard Review

Tribromoneopentyl alcohol:
Existing Data Summary Table – Human Health Endpoints

✓= Endpoint characterized by existing data * = Data available but not adequate ✘ = Endpoint not applicable

As noted in this key, a check mark indicates that an endpoint was adequately characterized by existing studies. It does not indicate a positive or negative result for that particular endpoint.

Acute Toxicity	
Oral	✓
Dermal	
Inhalation	*
Eye irritation	✓
Dermal irritation	✓
Skin sensitization	*
Subchronic Toxicity	
28-Day oral	✓
90-Day oral	
Combined repeated dose with reproduction/ developmental toxicity screen	
21/28-Day dermal	
90-Day dermal	
90-Day inhalation	
Reproductive Toxicity	
Reproduction/ developmental toxicity screen	
Combined repeated dose with reproduction/ developmental toxicity screen	
Reproduction and fertility effects	

Developmental Toxicity	
Reproduction/ developmental toxicity screen	
Combined repeated dose with reproduction/ developmental toxicity screen	
Prenatal developmental	
Chronic Toxicity	
Chronic toxicity (two species)	
Combined chronic toxicity/ carcinogenicity	
Carcinogenicity	
Carcinogenicity (rat and mouse)	
Combined chronic toxicity/ carcinogenicity	

Neurotoxicity	
Acute and 28-day delayed neurotoxicity of organophosphorus substances (hen)	✘
Neurotoxicity screening battery (adult)	
Developmental neurotoxicity	
Additional neurotoxicity studies	
Immunotoxicity	
Immunotoxicity	
Genotoxicity	
Gene mutation in vitro	✓
Gene mutation in vivo	
Chromosomal aberrations in vitro	✓
Chromosomal aberrations in vivo	
DNA damage and repair	
Other	✓

Tribromoneopentyl alcohol:
Existing Data Summary Table – Properties, Fate, and Ecotoxicity

✓= Endpoint characterized by existing data * = Data available but not adequate ✘ = Endpoint not applicable

As noted in this key, a check mark indicates that an endpoint was adequately characterized by existing studies. It does not indicate a positive or negative result for that particular endpoint.

P/Chem Properties	
Water solubility	✓
Octanol/water partition coefficient	✓
Oxidation/reduction	
Melting point	✓
Boiling point	
Vapor pressure	
Odor	
Oxidation/reduction chemical incompatibility	
Flammability	
Explosivity	✓
Corrosion characteristics	
pH	
UV/visible absorption	
Viscosity	
Density/relative density/bulk density	
Dissociation constant in water	
Henry's Law constant	

Environmental Fate	
Bioconcentration	
Fish	
Daphnids	
Green algae	
Oysters	
Earthworms	
Metabolism in fish	
Degradation and Transport	
Photolysis, atmosphere	
Photolysis, water	
Photolysis in soil	
Aerobic biodegradation	✓
Anaerobic biodegradation	
Porous pot test	
Pyrolysis	
Hydrolysis as a function of pH	
Sediment/water biodegradation	
Soil biodegradation w/ product identification	
Indirect photolysis in water	
Sediment/soil adsorption/desorption	

Ecotoxicity	
Aquatic Toxicity	
Fish acute LC50	✓
Daphnia acute EC50	✓
Mysid shrimp acute LC50	
Green algae EC50, NOAEC, LOAEC	✓
Fish chronic NOAEC, LOAEC	
Daphnia chronic NOAEC, LOAEC	
Mysid shrimp chronic NOAEC, LOAEC	
Terrestrial Organism Toxicity	
Bird LD50 (two species)	
Bird LC50 (two species)	
Bird reproduction	
Earthworm subchronic EC50, LC50, NOAEC, LOAEC	

Chemical Identity

1-Propanol, 2,2-dimethyl-, tribromo derivative
Synonym Tribromoneopentyl alcohol
CAS 36483-57-5
MF $C_5H_9Br_3O$
MW 324.84
SMILES BrC(C(CO)(C)C)(Br)Br

Human Health Endpoints

ACUTE TOXICITY

Acute Oral Toxicity (OPPTS Harmonized Guideline 870.1100; OECD Guidelines 425, 420, 423, 401).

Conclusion:

The available acute oral toxicity data were judged adequate to meet the endpoint.

Basis for Conclusion:

Several acute oral lethality studies were available in rats. One study summarized below as a critical study (Ameribrom, Inc., 1982a) conformed to OPPTS and OECD guidelines, but did not report the purity of the test substance. The other study summarized below (Norris et al., 1972a) was performed on a test substance containing a high purity of tribromoneopentyl alcohol (98.6%), but did not report all study details necessary for a full individual evaluation according to OPPTS and OECD guidelines. A confidential study using the acute toxic class method (OECD Guideline 423) provided lethality results for tribromoneopentyl alcohol (97% purity) that were consistent with the published studies. Thus, all available acute oral toxicity data report similar results for testing of tribromoneopentyl alcohol, and the quality of these studies, taken together, is adequate to support the evaluation of acute oral toxicity.

Critical Studies:

Type: Acute oral toxicity
Species, strain, sex, number: Charles River CD rats, 5 animals/sex/dose
Dose: 2,575, 3,204, 3,289, 3,501, 3,769, and 4,117 mg/kg
Purity: Not reported, off-white crystals
Vehicle: Corn oil
Observation Period: 14 days
Method: Designed to conform to U.S. EPA, Pesticide Programs, Proposed Guidelines for Registering Pesticides in the U.S., Hazard Evaluation: Humans and Domestic Animals, 163.81-1, dated 22 August, 1978; preliminary test followed by main study

Results: Male mortality was 2/5 at 2,575 and 3,204 mg/kg, 4/5 at 3,289, 3,501, 3,769, and 4,117 mg/kg. Female mortality was 2/5 at 2,575 and 3,501 mg/kg, 3/5 at 3,769 mg/kg, 4/5 at 3,204 and 3,289 mg/kg, and 5/5 at 4,117 mg/kg. LD50 (male) = 2,847 mg/kg (95% CI = 2,050-3,644). LD50 (female) = 2,685 mg/kg (95% CI = 1,415-3,955). LD50 (combined) = 2,823 mg/kg (95% CI = 2,217-3,429). Clinical signs noted included decreased motor activity, proneness, ataxia, brady-pnoea, ptosis, irritability, hunching, reddening, urogenital wetting and bleeding, lachrymation, salivation, haematuria, coat staining, piloerection, and ungroomed appearance. Necropsy findings consisted of gastric mucosa congestion, ulceration, erosion, or hemorrhage, associated with abnormal oily and yellow contents. The small intestine was usually distended with hemorrhagic, pale, or yellow contents. One female at 3,769 mg/kg and one male at 4,117 mg/kg had congestion of the urinary bladder; the bladder contents were blood-stained in the male with bladder congestion.
Reference: Ameribrom, Inc., 1982a

Type: Acute oral toxicity
Species, strain, sex, number: Sprague Dawley albino rat, 5 males/dose
Dose: 1,260, 1,580, 2,000, and 2,520 mg/kg
Purity: 98.6% tribromoneopentyl alcohol
Vehicle: Corn oil
Observation period: 13 days
Method: Test material administered as a 20% solution in corn oil to fasted rats by single dose gavage. Animals were weighed before dosing, the day following dosing, and at weekly intervals for 2 weeks thereafter. Clinical observations made "periodically" for signs of toxicity.
Results: LD50 = 1,630 mg/kg (95% CI = 1,370-1,950). Mortality was 0/5 at 1,260 mg/kg, 4/5 at 1,580 mg/kg, 3/5 at 2,000 mg/kg, and 4/5 at 2,520 mg/kg. Animals at all dose levels were noted as having bloody urine. Necropsy revealed hemorrhagic appearance of the mucosa of the urinary bladder at the highest dose level.
Reference: Norris et al., 1972a

Additional Studies and Information:

Other studies that were of lesser quality (such as a low percentage of tribromoneopentyl alcohol in test substance) or that were reported in less detail are generally consistent with the above studies (Biochemical Research Laboratory, no date; Norris et al., 1972b; Toxicology Research Laboratory, 1976).

Acute Dermal Toxicity (OPPTS Harmonized Guideline 870.1200; OECD Guideline 402)

Conclusion:

No available acute dermal toxicity data.

***Basis for Conclusion*:**

No studies of this type were located.

Acute Inhalation Toxicity (OPPTS Harmonized Guideline 870.1300 (OECD Guideline 403)

Conclusion:

The available acute inhalation toxicity data were judged inadequate to meet the endpoint.

Basis for Conclusion:

The only available study of tribromoneopentyl alcohol (Norris et al., 1972a), summarized below, did not fully conform to OPPTS and OECD guidelines. Study details to allow for a full evaluation of study adequacy were missing, and the test atmosphere was not characterized. In addition, only one concentration was tested, which did not produce mortality or toxicity, and was lower than the currently recommended limit dose for single dose testing. An additional study, conducted and reported in the same manner, was performed on a mixture containing only 11.3% tribromoneopentyl alcohol (Norris et al., 1972b).

Type: Acute inhalation toxicity
Species, strain, sex, number: Sprague Dawley rats, 5 males
Doses: 0.714 mg/liter of air (nominal)
Purity: 98.6%
Vehicle: None
Duration: 7-hour exposure
Observation Period: 2 weeks
Method: The test substance (a solid at room temperature) was maintained at 100°C. Air was metered through the test substance and into the 19 L glass exposure chamber at the rate of 1 liter/minute; according to the investigators, this procedure produced a vapor. Whether the substance in the test chamber was exclusively a vapor, or whether aerosol or particulate was formed, is uncertain. The exposure period was 7 hours. Clinical observations were made during the exposure period and up to 2 weeks thereafter (no specification of frequency). Body weight was measured before and after exposure and "periodically" for 2 weeks thereafter. Necropsy was performed on 1 rat 1 day after exposure and on the remaining 4r rats at the end of the observation period.
Results: No mortality, signs of toxicity, respiratory or nasal irritation, or abnormal body weight changes were observed during the exposure or observation period. No abnormalities were noted at necropsy.
Reference: Norris et al., 1972a

Additional Study:

An acute inhalation toxicity study of a mixture containing only 11.3% tribromoneopentyl alcohol (plus 81.1% dibromoneopentyl glycol and 7.6% monobromoneopentyl triol) (Norris et al., 1972b) was performed in a similar manner as the above study. The nominal exposure concentration of this mixture was 2.49 mg/L. The nominal exposure concentration of tribromoneopentyl alcohol would have been 0.28 mg/L, a lower concentration than in the above study of relatively pure tribromoneopentyl alcohol. There were no deaths, but labored breathing and slight signs of nasal irritation were observed in the rats during exposure. The rats appeared normal during the 2-week observation period and no pathological changes were observed during necropsy. The apparent irritant effects in this study cannot be attributed solely to tribromoneopentyl alcohol, which accounted for only a small percentage of the mixture, and which caused no signs of irritation when tested alone at a higher concentration.

Acute Eye Irritation (OPPTS Harmonized Guideline 870.2400; OECD Guideline 405)

Conclusion:

The available acute eye irritation data were judged adequate to meet the endpoint.

Basis for Conclusion:

The study summarized below as a critical study (Ameribrom, Inc., 1982b) conformed to OPPTS and OECD guidelines, and observed mild eye irritation, but did not report the purity of the test substance. A subsequent confidential (OPPTS and OECD guideline) study of tribromoneopentyl alcohol (97% purity) in the rabbit reported moderate eye irritation. Other available data, though inadequate for individual evaluation, reported similar results to these two studies and provide support for the acute eye irritation evaluation.

Critical Studies:

Type: Acute eye irritation
Species, strain, sex, number: New Zealand White albino rabbits, 9/sex
Doses: 100 mg
Purity: Not reported; off-white crystals
Vehicle: None
Method: The study was designed to conform to the U.S. EPA, Pesticides Program, Proposed Guidelines for Registering Pesticides in the U.S.; Hazard Evaluation: Human and Domestic Animals 163.81-4, dated 22 August, 1978. Six rabbits were tested without any washing of test substance from the eye. Three rabbits were tested with irrigation of the eye after 30 seconds of exposure. Eyes were assessed at 24, 48, and 72 hours and 4, 7, 10, and 13 days after test administration.
Results: Almost all animals of both groups (unwashed exposure and washed exposure) exhibited diffuse opacity (Grade 1 on a scale of 1-4) on the cornea at 24 hours after exposure. One rabbit

from the unwashed group exhibited Grade 2 opacity. Irridial congestion was also noted in most animals in the unwashed exposure group. Conjunctival irritation, such as redness and discharge, was observed in both the unwashed and washed exposure groups at varying degrees. All ocular effects were fully reversible by the end of the observation period with many being fully resolved a few days after exposure.
Reference: Ameribrom, Inc., 1982b

Additional Studies and Information:

Other studies that were of lesser quality (such as a low purity of tribromoneopentyl alcohol in test substance) or were reported in less detail are generally consistent with the above study (Keeler et al., 1974; Biochemical Research Laboratory, no date).

Acute Dermal Irritation (OPPTS Harmonized Guideline 870.2500; OECD Guideline 404)

Conclusion:

The available acute dermal irritation data were judged adequate to meet the endpoint.

Basis for Conclusion:

The study summarized below (Ameribrom, Inc., 1982c) generally conformed to OPPTS and OECD guidelines with only slight derivations and detail omissions, except for the lack of reporting of test substance purity. Although a summary table was also available for another acute dermal irritation study (Biochemical Research Laboratory, no date) that reported similar results to the above mentioned study, few study details were reported in the table.

Type: Acute dermal irritation
Species, strain, sex, number: New Zealand White albino rabbits, 3/sex
Doses: 0.5 g
Purity: Not reported, off-white crystals
Vehicle: Saline, enough to moisten test material
Method: The study was designed to conform with the U.S. EPA, Pesticides Programs, Proposed Guidelines for Registering Pesticides in the U.S.; Hazard Evaluation: Humans and Domestic Animals 163,82-5, dated 22 August 1978. Single application of slightly saline-moistened test material to shaved skin under an occlusive wrap. The skin of one side of each animal was mildly abraded and the skin of the other side was left intact. The test material was applied to both sides. The dressings were removed 24 hours after dosing and residual test material was removed by wiping with towels. Animals were regularly checked for clinical signs of toxicity during exposure and were checked daily from day 2 of the study until study termination. Skin irritation assessments were made 1 hour after removal of the wrap, as well as 72 hours and 4 and 5 days after application of the test material.
Results: At 25 hours after application, very slight to well-defined erythema was displayed in most animals and moderate-to-severe erythema was displayed in two animals. At 72 hours after

application, four rabbits displayed very slight erythema and two rabbits displayed well-defined erythema. One rabbit displayed a very slight edema. At 4 days after application, one rabbit displayed very slight erythema. All skin responses were completely resolved by the final assessment 5 days after application. Exfoliation was observed in three female rabbits from 72 hours after application until study termination. Incidence or severity of dermal irritation was not affected by abrasion of skin before treatment. The authors concluded that the test substance was a mild irritant to the skin.
Reference: Ameribrom, Inc., 1982c

Additional Studies:

Another study, reported with few details (Biochemical Research Laboratory, no date), was generally consistent with the results of the above study. In this other study, undiluted tribromoneopentyl alcohol was applied to the belly of rabbits for 10 applications (intact skin, no irritation occurred) or 3 applications (abraded akin, slight hyperemia on abrasions after each of the first two applications). Slight hyperemia and slight exfoliation occurred after similar applications to intact and abraded belly skin of a 10% solution of tribromoneopentyl alcohol in Dowanol DPM. There was no indication of absorption of acutely toxic amounts (not further explained).

Skin Sensitization (OPPTS Harmonized Guideline 870.2600; OECD Guideline 429)

Conclusion:

The available skin sensitization data were judged inadequate to meet the endpoint.

Basis for Conclusion:

The available skin sensitization study was performed on a test substance mixture containing only 13.6 % tribromoneopentyl alcohol (plus 81% dibromoneopentyl glycol and 5.4% monobromoneopentyl triol) (Keeler et al., 1974). Toxicological effects of the individual component chemical, tribromoneopentyl alcohol, may differ from effects produced by the combination of the chemicals in the mixture. The study also did not conform fully to OPPTS and OECD guidelines. Results were negative for dermal sensitization in this study in guinea pigs.

SUBCHRONIC TOXICITY

Subchronic Oral Toxicity (28-day, 90-day, or combined with reproductive/developmental)

Conclusion:

The available subchronic oral toxicity data were judged adequate to meet the endpoint.

Basis for Conclusion:

The only available study for subchronic oral toxicity is a 30-day study in rats (Humiston et al, 1973), which was reasonably comprehensive, and conducted in a manner similar to the guideline specifications. Differences from the guidelines are as follows: the frequency of clinical observations was not reported; not all of the stipulated observations with regard to hematology, clinical chemistry, organ weights, and histopathology were made; and a limited neurobehavioral assessment was not performed. In these hazard reviews on the flame retardant alternatives, however, the adequacy of neurotoxicity data is considered separately, so this data gap will be noted under that topic. The 30-day study included urinalysis, which is not a guideline requirement, but provides valuable information.

- **Repeated Dose 28-Day Oral Toxicity in Rodents (OPPTS Harmonized Guideline 870.3050; OECD Guideline 407)**

The only relevant available study is a 30-day repeated oral dose study, summarized below, which was conducted in a manner similar to the guidelines for a 28-day oral toxicity study in rodents.

Type: Repeated-dose 30-day oral toxicity
Species, strain, sex, number: Sprague-Dawley rats, 5/sex/dose
Doses: 0, 10, 30, 100, and 300 mg/kg/day
Purity: 98.0%
Vehicle: None
Exposure period, frequency: 30 days, administered daily in diet (food constantly available)
Post Exposure Period: None
Method: The test substance was administered in the diet. The rats were weighed initially then weekly throughout the study, and were observed for clinical signs, but frequency of this observation was not reported. Food consumption was measured weekly, and dietary concentrations were adjusted to maintain the target dosages. Hematologic evaluations (packed cell volume, hemoglobin, total erythrocyte count, total and differential leukocyte counts) and urinalysis (specific gravity, pH, sugar, proteins, occult blood, bilirubin) were performed on study day 24 in the control and high dose groups. Clinical chemistry analyses [BUN, alkaline phosphatase, SGPT (ALT)] were performed on blood samples collected from all the rats at the termination of the study. A complete necropsy was performed, and heart, liver, kidney, testes, and brain were weighed. A reasonably comprehensive selection of tissues was examined histologically in high dose and control animals. Liver, kidney, and bladder were examined histologically in the low- and mid-dose animals. Statistical analyses were performed on the continuous variables.
Results: A statistically significant increase in BUN in male rats was noted at 300 mg/kg/day. No significant changes were seen in the urinalysis results. Dose-related histopathologic changes in kidney (degeneration and regeneration of renal cortical tubular epithelial cells) and urinary bladder tissue (generalized hyperplasia of the transitional epithelium) were noted only in male rats at $\geq$100 mg/kg/day. Incidences of each of these effects were 0/5 in controls and in each of the two lower dose groups, 2/5 in the 100 mg/kg/day group, and 5/5 in the 300 mg/kg/day group.

Bladder effects were seen in some of the acute oral toxicity studies as well. Because the tissue staining procedures may not have been optimal for visualizing hyaline droplets in renal tissue, the possibility that the renal effects may have been related to $alpha_{2u}$-globulin associated renal toxicity cannot be ruled out. The OPPTS and OECD guidelines, however, do not address the issue of staining techniques. No changes in any of the endpoints were noted in the female rats, and no changes in endpoints other than those noted above were seen in the males. Although $alpha_{2u}$-globulin associated nephropathy is not considered relevant to humans (U.S. EPA, 1991), not all chemically-induced male rat nephropathy is of this type. Therefore, in the absence of additional information, the renal lesions are considered relevant. The NOAEL for bladder and renal effects was 30 mg/kg/day and the LOAEL was 100 mg/kg/day.
Reference: Humiston et al., 1973

- **90-Day Oral Toxicity in Rodents (OPPTS Harmonized Guideline 870.3100; OECD Guideline 408)**

No studies of this type were located.

- **Combined Repeated Dose Toxicity Study with the Reproduction/Developmental Toxicity Screening Test (OPPTS Harmonized Guideline 870.3650; OECD Guideline 422)**

No studies of this type were located.

Subchronic Dermal Toxicity (21/28-day or 90-day)

Conclusion:

No available subchronic dermal toxicity data.

Basis for Conclusion:

No pertinent subchronic dermal toxicity studies were located that addressed the endpoints in the guidelines listed below.

- **21/28-Day Dermal Toxicity (OPPTS Harmonized Guideline 870.3200 (OECD Guideline 410)**
- **90-Day Dermal Toxicity (OPPTS Harmonized Guideline 870.3250; OECD Guideline 411)**

Subchronic Inhalation Toxicity: 90-Day Inhalation Toxicity (OPPTS Harmonized Guideline 870.3465; OECD Guideline 413)

Conclusion:

No available subchronic inhalation toxicity data.

Basis for Conclusion:

No studies of this type were located.

REPRODUCTIVE TOXICITY

Conclusion:

No available reproductive toxicity data.

Basis for Conclusion:

No pertinent studies were located that addressed the reproductive toxicity endpoints in the guidelines listed below.

- **Reproduction/Developmental Toxicity Screening (OPPTS Harmonized Guideline 870.3550; OECD Guideline 421)**
- **Combined Repeated Dose Toxicity Study with the Reproduction/Developmental Toxicity Screening Test (OPPTS Harmonized Guideline 870.3650; OECD Guideline 422)**
- **Reproduction and Fertility Effects (OPPTS Harmonized Guideline 870.3800; OECD Guideline 416)**

DEVELOPMENTAL TOXICITY

Conclusion:

No available developmental toxicity data.

Basis for Conclusion:

No pertinent studies were located that addressed the developmental toxicity endpoints in the guidelines listed below.

- **Prenatal Developmental Toxicity Study (OPPTS Harmonized Guideline 870.3700; OECD Guideline 414)**

- **Combined Repeated Dose Toxicity Study with the Reproduction/Developmental Toxicity Screening Test (OPPTS Harmonized Guideline 870.3650; OECD Guideline 422)**
- **Reproduction/Developmental Toxicity Screening (OPPTS Harmonized Guideline 870.3550; OECD Guideline 421)**

CHRONIC TOXICITY

Conclusion:

No available chronic toxicity data.

Basis for Conclusion:

No pertinent were located that addressed the chronic toxicity studies endpoints in the guidelines listed below.

- **Chronic Toxicity (OPPTS Harmonized Guideline 870.4100; OECD Guideline 452)**
- **Combined Chronic Toxicity/Carcinogenicity (OPPTS Harmonized Guideline 870.4300; OECD Guideline 453)**

CARCINOGENICITY

Conclusion:

No available carcinogenicity data.

Basis for Conclusion:

No pertinent studies were located that addressed the carcinogenicity endpoints in the guidelines listed below.

- **Carcinogenicity (OPPTS Harmonized Guideline 870.4200; OECD Guideline 451)**
- **Combined Chronic Toxicity/Carcinogenicity (OPPTS Harmonized Guideline 870.4300; OECD Guideline 453)**

NEUROTOXICITY

Conclusion:

No available neurotoxicity data.

Basis for Conclusion:

No pertinent neurotoxicity studies were located that addressed the endpoints in the guidelines listed below.

Delayed Neurotoxicity

- **Acute and 28-Day Delayed Neurotoxicity of Organophosphorus Substances (OPPTS Harmonized Guideline 870.6100; OECD Guideline 418, 419)**

  Note this guideline is not relevant for tribromoneopentyl alcohol, which is not an organophosphorus substance.

Neurotoxicity (Adult)

- **Neurotoxicity Screening Battery (OPPTS Harmonized Guideline 870.6200; OECD Guideline 424)**

Developmental Neurotoxicity: Developmental Neurotoxicity Study (OPPTS Harmonized Guideline 870.6300)

Additional neurotoxicity studies:

- Schedule-Controlled Operant Behavior (mouse or rat)
  - OPPTS Harmonized Guideline 870.6500
- Peripheral Nerve Function (rodent)
  - OPPTS Harmonized Guideline 870.6850
- Sensory Evoked Potentials (rat, pigmented strain preferred)
  - OPPTS Harmonized Guideline 870.6855

These studies may be indicated, for example, to follow up neurotoxic signs seen in other studies, or because of structural similarity of the substance to neurotoxicants that affect these endpoints. These studies may be combined with other toxicity studies.

IMMUNOTOXICITY

***Conclusion*:**

No available immunotoxicity data.

Basis for Conclusion:

No pertinent immunotoxicity studies were located that addressed the endpoints in the guideline listed below.

- **Immunotoxicity (OPPTS Harmonized Guideline 870.7800)**

GENOTOXICITY

Conclusion:

The available genotoxicity data were judged adequate to meet the endpoint.

Basis for Conclusion:

Adequate data were submitted for mutagenicity and chromosomal aberrations *in vitro*. Four studies of reverse mutation in bacteria *in vitro* reported negative results without activation or with activation using liver S9 from rat, rabbit, or monkey. These studies did not conform fully to OPPTS and OECD guidelines or were missing vital study details, but reported similar results. One study reported that activation with hamster S9 resulted in reverse mutation in bacteria. An additional, confidential, OECD guideline study of reverse mutation in bacteria *in vitro* also reported negative results without activation or with rat liver S9, and positive results with hamster liver S9. Other confidential studies reported positive results, with metabolic activation, for mutagenicity in cultured mouse lymphoma cells and chromosomal aberrations in cultured human peripheral lymphocytes.

Gene Mutation in Vitro:

- **Bacterial Reverse Mutation test (OPPTS Harmonized Guideline 870.5100; OECD Guideline 471)**

Type: Bacterial reverse mutation
Species, strain: *Salmonella typhimurium* TA-1535, TA-100, TA-1538, TA-98, and TA-1537
Metabolic activation: Absence and presence of an activating system derived from rat liver (S-9 mix)
Concentrations: 50, 250, 1,250, 2,500, and 5,000 µg/plate
Purity: Not reported
Solvent: DMSO
Method: Procedures stated as complying with OECD Guideline 471 (1983); preliminary toxicity test in strain TA-98. The assay utilized a plate incorporation method. The main study was conducted in duplicate with a negative solvent control, positive controls, and plates devoid of organisms to verify the sterility of the S-9 mix. Incubation at 37°C for 48 hours.
Results: No significant increases in revertant colony numbers over control counts were obtained for trineopentyl alcohol with any of the tester strains, either in the presence or absence of metabolic activation.
Reference: Ameribrom, Inc., 1990

Type: Bacterial reverse mutation
Species, strain: *Salmonella typhimurium* TA-1535, TA-100, TA-1538, TA-98, and TA-1537

Metabolic activation: With and without S-9 mix
Concentrations: 0, 50, 100, 500, and 1,000 μg/plate
Purity: Not reported
Solvent: DMSO
Method: The test was reported as having been performed in accordance with the methods described in detail in the "Principles of the Ames Mutagenicity Test" by M. Green and E. Riklis of 1979. Each compound was tested at least twice and in duplicates. Negative controls. Positive controls, such as methylcholantrene, benzopyrene, and N-methyl-N-nitrosoguanidine (MNNG).
Results: The compound was not mutagenic.
Reference: Ameribrom, Inc., 1982d

Type: Bacterial reverse mutation
Species, strain: *Salmonella typhimurium* TA-1535, TA-1537, and TA-1538
Metabolic activation: With and without mammalian (rabbit, rat, and monkey) metabolic activation
Concentrations: 0.05% (plate tests); 0.025%, 0.050%, and 0.100% (suspension tests)
Purity: >99%, "pure" tribromoneopentyl alcohol
Solvent: DMSO or saline
Method: Cytotoxicity testing performed. Positive and negative controls used. Plate incubation at 37°C for 4 days, with each compound done in duplicate. Suspension tests were conducted with metabolic activation at 37°C for 1 hour in an oxygen atmosphere, or without metabolic activation at 37°C for 1 hour, with all flasks shaken during treatment. Suspension tests were scored after plating and incubation for 48 hours at 37°C.
Results: The test substance did not exhibit genetic activity under any of the testing conditions (plate tests, with and without activation; suspension tests, with and without activation) employed in this study.
Reference: Litton Bionetics, Inc., 1975a

Type: Bacterial reverse mutation
Species, strain: *Salmonella typhimurium* TA-1535, TA-1537, and TA-1538
Metabolic activation: With and without mammalian (rabbit, rat, and monkey) metabolic activation
Concentrations: 0.150% (plate tests); 0.075%, 0.150%, and 0.300% (suspension tests)
Purity: Not reported, "plant" tribromoneopentyl alcohol
Solvent: DMSO or saline
Method: Cytotoxicity testing performed. Positive and negative controls used. Plate incubation at 37°C for 4 days, with each compound done in duplicate. Suspension tests were conducted with metabolic activation at 37°C for 1 hour in an oxygen atmosphere, or without metabolic activation at 37°C for 1 hour, with all flasks shaken during treatment. Suspension tests were scored after plating and incubation for 48 hours at 37°C.
Results: The test substance did not exhibit genetic activity when all test data were considered. The negative assessment was based on combined test results for both rat and rabbit activation assays and non-activation assays, as two sets of original test data with TA-1535 (one with rat

tissue, one with rabbit tissue) suggested mutagenic activity, but repeat tests with this strain did not indicate mutagenic activity.
Reference: Litton Bionetics, Inc., 1975b

Additional Information

Results of a 1983 preincubation assay in *Salmonella typhimurium*, listed on the NTP (2004) online database, confirm the negative results of other studies in TA100, TA98, TA1535, and TA1537 without activation or with activation by rat liver S9. Activation using S9 from hamster liver resulted in positive results in TA100 and TA1535, but negative results in the two other strains. A more recent confidential study of 98% pure tribromoneopentyl alcohol, conducted according to OECD guideline 471 (May 1983 version) in *S. typhimurium* (TA98, TA100, TA1535, TA1537), also reported negative results without an activating system or with rat liver S9 in all four strains, and positive results with hamster liver S9 in TA100 and TA1535 only.

- **In vitro Mammalian Cell Gene Mutation Test (OPPTS Harmonized Guideline 870.5300; OECD Guideline 476)**

A confidential study reported dose-related mutagenicity in cultured L5178Y mouse lymphoma cells treated with tribromoneopentyl alcohol with, but not without metabolic activation.

Chromosomal Aberrations in vitro:

- **In Vitro Mammalian Chromosome Aberration Test (OPPTS Harmonized Guideline 870.5375; OECD Guideline 473)**

A confidential study reported that, with, but not without metabolic activation, tribromoneopentyl alcohol increased the frequency of chromosomal aberrations in human peripheral lymphocytes *in vitro*.

Other

- **Mitotic Gene Conversion in Saccharomyces cerevisiae (OPPTS Harmonized Guideline 870.5575)**

The two available studies, conducted by the same laboratory at about the same time, appear marginally adequate.

Type: Mitotic gene conversion
Species, strain: *Saccharomyces cerevisiae* D4
Metabolic activation: With and without mammalian (rabbit, rat, and monkey) metabolic activation
Concentrations: 0.5%, 1.0%, and 2.0%

Purity: >99%, “pure” tribromoneopentyl alcohol
Solvent: DMSO or saline
Method: Cytotoxicity testing performed. Suspension tests were conducted with metabolic activation at 37°C in an oxygen atmosphere for 4 hours, and without metabolic activation at 30°C for 4 hours, with all flasks shaken during treatment. Scoring was done after plating and incubation for 3-5 days at 30°C. Concurrent negative controls, positive controls run concurrently with the non-activation assay. Study authors state (without reporting the data) that the positive controls for activation assay were run on a different day, but cell culture was the same. The authors may be referring to the positive control data reported in the appendix of the following report on “plant” tribromoneopentyl alcohol.
Results: The test substance did not exhibit genetic activity either with or without metabolic activation.
Reference: Litton Bionetics, Inc., 1975a

Type: Mitotic gene conversion
Species, strain: *Saccharomyces cerevisiae* D4
Metabolic activation: With and without mammalian (rabbit, rat, and monkey) metabolic activation
Concentrations: 0.375%, 0.750%, and 1.500%
Purity: Not reported, “plant” tribromoneopentyl alcohol
Solvent: DMSO or saline
Method: Cytotoxicity testing performed. Suspension tests were conducted with metabolic activation at 37°C in an oxygen atmosphere for 4 hours, and without metabolic activation at 30°C for 4 hours, with all flasks shaken during treatment. Scoring was done after plating and incubation for 3-5 days at 30°C. Concurrent negative controls. Concurrent positive controls for the activation assays. Positive control data for the non-activation assay were not reported, but may have been those in the above mitotic gene conversion study with pure tribromoneopentyl alcohol.
Results: The test substance did not exhibit significant genetic activity either with or without metabolic activation.
Reference: Litton Bionetics, Inc., 1975b

No studies were available on the genotoxicity of tribromoneopentyl alcohol in the following types of types of tests:

Gene Mutation in Vivo
Chromosomal Aberrations in Vivo
DNA Damage and Repair

Ecotoxicity

Acute Toxicity to Aquatic Organisms

Conclusion:

The available acute toxicity data for fish, aquatic invertebrates, and algae were judged adequate to meet the endpoints. The acute marine/estuary toxicity endpoints for fish, aquatic invertebrates were judged inadequate to meet the endpoints.

Basis for Conclusion:

- **Acute Toxicity to Freshwater and Marine Fish (OPPTS Harmonized Guideline 850.1075; OECD Guideline 203)**

A confidential study in *Cyprinus carpio* (carp), with a 96-hour LC50 of 32 mg/L, conducted under static test conditions, was submitted. The LC0 was 18 mg/L. A 14-day study in *Cyprinus carpio* (carp), conducted under semi-static test conditions, was also submitted. The 14-day LC50 was >32 mg/L. The NOEC and LOEC for sublethal effects were 5.6 and 10 mg/L, respectively. The available data were judged adequate to meet this endpoint.

- **Acute Toxicity to Freshwater Invertebrates (OPPTS Harmonized Guideline 850.1010; OECD Guideline 202)**

A confidential study in *Daphnia magna* was submitted. The 48-hour EC50 for immobility was 64 mg/L under static test conditions. The NOEC was 32 mg/L. The available data were judged adequate to meet this endpoint.

- **Algal Toxicity (OPPTS Harmonized Guideline 850.5400; OECD Guideline 201)**

A confidential study in *Selenastrum capricornutum* was submitted. The 72-hour EC50 values for cell growth inhibition (biomass) and growth rate reduction were 28 and >100 mg/L, respectively, under static test conditions. The 72-hour NOEC was 2.2 mg/L. The available data were judged adequate to meet this endpoint.

No additional acute toxicity studies with freshwater or saltwater fish, aquatic invertebrates, or algae were located that followed or were similar to the guideline protocol listed below.

- **Acute Toxicity to Marine/Estuarine Invertebrates (OPPTS Harmonized Guideline 850.1035)**

Chronic Toxicity to Aquatic Organisms

Conclusion:

No available chronic toxicity data for fish and aquatic invertebrates.

Basis for Conclusion:

No pertinent chronic toxicity studies with fish or aquatic invertebrates were located that addressed the endpoints in the guidelines listed below.

- **Chronic Toxicity to Freshwater and Marine Fish (OPPTS Harmonized Guideline 850.1400; OECD Guideline 210)**
- **Chronic Toxicity to Freshwater Invertebrates (OPPTS Harmonized Guideline 850.1300; OECD Guideline 211)**
- **Chronic Toxicity to Marine/Estuarine Invertebrates (OPPTS Harmonized Guideline 850.1350)**

Acute and Subchronic Toxicity to Terrestrial Organisms

Conclusion:

No available acute and subchronic toxicity data for terrestrial organisms.

Basis for Conclusion:

No pertinent acute oral, acute dietary, or reproductive toxicity studies with birds and no subchronic toxicity studies with earthworms were located that addressed the endpoints in the guidelines listed below.

- **Acute Oral Toxicity in Birds (OPPTS Harmonized Guideline 850.2100)**
- **Acute Dietary Toxicity in Birds (OPPTS Harmonized Guideline 850.2200; OECD Guideline 205)**
- **Reproductive Toxicity in Birds (OPPTS Harmonized Guideline 850.2300; OECD Guideline 206)**
- **Earthworm Subchronic Toxicity (OPPTS Harmonized Guideline 850.6200; OECD Guideline 207)**

Physical/Chemical Properties

1-Propanol, 2,2-dimethyl-, tribromo derivative
Synonym Tribromoneopentyl alcohol
CAS 36483-57-5
MF $C_5H_9Br_3O$
MW 324.84
SMILES BrC(C(CO)(C)C)(Br)Br

Water Solubility (mg/L):

Conclusion:

The available water solubility data are adequate.

Basis for Conclusion:

A confidential experimental study for the water solubility of tribromoneopentyl was submitted. Using OECD Guideline 105, a water solubility of 1,930 mg/L at 20.1°C was measured.

Log K_{ow}:

Conclusion:

The available log K_{ow} data are adequate.

Basis for Conclusion:

A confidential experimental study for the log K_{ow} of tribromoneopentyl was submitted. Using OECD Guideline 117, a log K_{ow} of 2.6 was measured using the HPLC method.

Oxidation/Reduction: No data

Melting Point:

Conclusion:

The available melting point data are adequate.

Basis for Conclusion:

The melting point of tribromoneopentyl has been reported as 62-67°C in confidential EPA databases.

Vapor Pressure (torr): No data

Odor: No data

Oxidation/Reduction Chemical Incompatibility: No data

Flammability: No data

Explosivity:

Conclusion:

The available explosivity data are adequate.

Basis for Conclusion:

A confidential study was submitted indicating that tribromoneopentyl alcohol has a low explosion severity potential in a 20 litre sphere test.

Corrosion Characteristics: No data

pH: No data

UV/VIS Absorption: No data

Viscosity: No data

Density/Relative Density/Bulk Density: No data

Dissociation Constant in Water: No data

Henry's Law Constant: No data

Environmental Fate

Bioconcentration

Fish: No data

Daphnids: No data

Green Algae: No data

Oysters: No data

Earthworms: No data

Fish Metabolism: No data

Degradation and Transport

Photolysis in the Atmosphere: No data

Photolysis in Water: No data

Photolysis in Soil: No data

Aerobic Biodegradation:

Conclusion: The available aerobic biodegradation data are adequate.

Basis for Conclusion: Submitted confidential studies indicate that tribromoneopentyl alcohol underwent 2.5% CO_2 evolution over 28 days in an OECD 310 test and 77% removal as DOC using OECD 302B in 36 days after a 10-day lag period (MC). In addition, a submitted confidential study indicates that tribromoneopentyl alcohol is not ready biodegradable.

Anaerobic Biodegradation: No data

Porous Pot Test: No data

Pyrolysis: No data

Hydrolysis as a Function of pH: No data

Sediment/Water Biodegradation: No data

Soil Biodegradation with Product Identification: No data

Indirect Photolysis in Water: No data

Sediment/Soil Adsorption/Desorption: No data

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